

# electronics today

MAY 1978

INTERNATIONAL

45p

## ROBOTS

How close to reality?



**ELECTRONIC  
IGNITION**

**HELPING HAND  
PROJECT**

**STAR TREK  
RADIO**

**CCD PHASER**

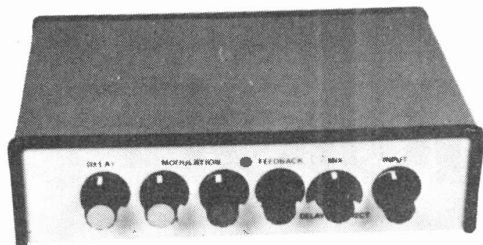
**MULTIPLE  
OFFERS INSIDE**

**TV TANK GAME**



... NEWS ... PROJECTS ... MICROPROCESSORS ... AUDIO ...

## C.C.D. PHASER



**COMPLETE KIT**  
(Designer Approved)

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inc. VAT & P&P

—70db signal to noise ratio

This kit comes with silkscreened, prepunched case and is complete down to the last nut and bolt—all you need are a soldering iron, solder, wirecutters and screwdriver plus an evening's work.

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Panel Meters, Bridge Rectifiers, Power Supply Units  
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3-0-3	200	238	1.95	55
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9-0-9	100	13	1.85	40
0-9-0-9	330 330	235	1.95	40
0-8-9-0-8-9	500 500	207	2.35	55
0-8-9-0-8-9	1A 1A	208	3.50	55
0-15-0-15	200 200	236	1.95	40
0-20-0-20	300 300	214	2.35	70
20-12-0-12-20	700(DC)	221	3.10	70
0-15-20-0-15-20	1A 1A	206	4.20	85
0-15-27-0-15-27	500 500	203	3.65	70
0-15-27-0-15-27	1A 1A	204	4.75	85

### 12 AND/OR 24 VOLT

Pri. 220-240 Volts					
Amps				Price	
12V	24V	Ref.	£	P&P	
0.5	0.25	111	1.95	55	
1.0	0.5	213	2.30	70	
2	1	71	2.90	70	
4	2	18	3.75	70	
6	3	70	5.35	85	
8	4	108	6.25	100	
10	5	72	6.95	100	
12	6	116	7.85	100	
16	8	17	9.25	110	
20	10	115	12.75	130	
30	15	187	16.60	130	
60	30	226	22.90	160	

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Sec 0-12-15-20-24-30V			
Amps	Ref No.	Price £	P&P
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1.0	79	3.05	70
2.0	3	4.80	85
3.0	20	5.80	1.00
4.0	21	6.85	1.00
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8.00	88	11.35	1.30
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1 0	103	4.20	.85
2 0	104	6.10	1 00
3 0	105	7.85	1 00
4 0	106	9.80	1.10
6 0	107	14.95	1.30
8 0	118	15.75	1.50
10 0	119	20.50	2.00

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Sec 0-24-30-40-48-60V			
Price			
Amps	Ref. No.	£	P&P*
0.5	124	3.40	70
1.0	126	4.65	.85
2.0	127	6.50	1.00
3.0	125	9.15	1.10
4.0	123	11.25	1.30
5.0	40	11.80	1.30
6.0	120	14.75	1.40

### AUTO TRANSFORMERS

Input/Output Tapped 0-115-210-240V

VA	Ref. No.	Price £	P&P
(Watts)			
20	113	2.25	70
75	64	3.50	70
150	4	5.35	85

Input/Output Tapped 0-115-210-220-240V

300	66	7.15	100
500	67	10.75	130
1000	84	17.00	140

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& Screened)			
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VA	Ref. No.	Price	P&P
(Watts)		£	
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100	150	6.40	1.00
200	151	10.00	1.10
250	152	11.95	1.30
350	153	14.45	1.40
1000	156	35.00	3.00

**BAYDIS**

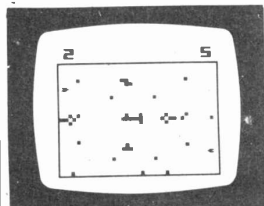
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## BUILDING THE TANK BATTLE TV GAME? BUY FROM US AND YOU'VE WON HALF THE BATTLE

### TANK BATTLES

Based on AY-3-8710 chip

B & W Kit	£19.90
Colour Kit	£25.90
Mini Kit	£13.90



★ Battle as Professional or Territorial Soldier.

- ★ On screen scoring coded to tanks.
- ★ Tanks controlled by toggle switches or joystick and fire button.
- ★ Realistic tank, shell burst and explosion sounds through TV speaker.
- ★ Three speed tank control.
- ★ Exploding mines and terrain barriers.
- ★ Guided missile shells
- ★ Single 9v supply.

Mini kits include instructions LSI, PCB, LSI Skt, Coil. Kits include full instructions LSI, PCB, pre-tuned UHF and sound modulators, etc. and Sound Modulators, pre-tuned £5.50 (pair). Joysticks for AY-3-8600 £3.50 (pair). Joysticks for AY-3-8710 (TBA) colour encoder module, pre-tuned £6.60. Regulated mains adaptor £3.50.

\*All prices include VT and P&P

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**VIDEOTIME PRODUCTS**

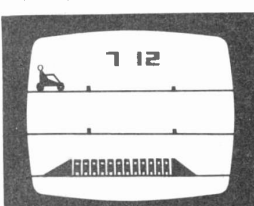
the video and time products people

Trade enquiries welcome

### STUNT RIDER

4 GAMES based on the

AY-3-8760 chip	£13.90
B & W Kit	£19.90
Colour Kit	£19.90
Mini Kit	£9.90



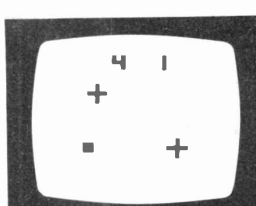
★ Super Stunt (illustrated). Bus Stunt. Moto-cross. Drag Race.

- ★ On Screen Scoring and Timing.
- ★ Realistic throttle and crash sounds through TV speaker.
- ★ Amateur or professional selection mode.
- ★ Simple potentiometer throttle control.
- ★ Single 9v supply.

### SUPER TELESPTS

10 GAMES based on the

AY-3-8600 chip	£20.50
B & W Kit	£26.50
Colour Kit	£26.50
Mini Kit	£13.90



★ Shoot 2-no rifle required! (illustrated). Shoot 1, Football, Hockey, Solo, Basketball, Gridball, Tennis, Squash, Basketball Practice.

- ★ On screen scoring coded to player.
- ★ Triple sounds through TV speaker.
- ★ Auto ball speed-up mode.
- ★ Controlled by joystick and fire/serve button.
- ★ Single 9v supply.

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# TANK BATTLE TV GAME

WHEN it comes to TV games — from now on think tanks because at last the tank battle chip from GI is here.

Ball and paddle games (yawn), stunt riders — less than stimulating, but tanks — *great*.

## Tanks A Lot

The tank battle gives each of the participating war mongers control of a tank (there's power for you), each of which can move forwards or backwards at three speeds and be rotated through 360°.

To move forwards the appropriate button on the hand-held unit must be pressed. After a short delay the tank will begin to move and if the button is

kept pressed, the tank will select second gear and then top gear. If the control is released at any time the tank will continue to move at the selected speed, it being necessary to engage reverse to stop the beastie.


Whether still or in motion the tank may be rotated in an anticlockwise or clockwise direction by means of the rotation controls.

## Mined Where You're Going

Having mastered the motion controls and got under way, you will come across two types of obstacle. The white blocks on screen are fixed

barriers and your tank will not go through them. The black objects are mines — if you run into one of these fellows your tank will be blown up and your opponent score a point.

## Tanking Up

Now the object of the game — to blast your fellow man into the ground. The means of achieving this aim is your tank's gun. This impressive weapon fires not so much shells but more guided missiles. After leaving the tank the trajectory of these offensive weapons can be changed by means of the tank's rotation controls. The range of the shell is about two thirds of the TV screen. 

C  
t  
a  
b  
a





ME

7

15

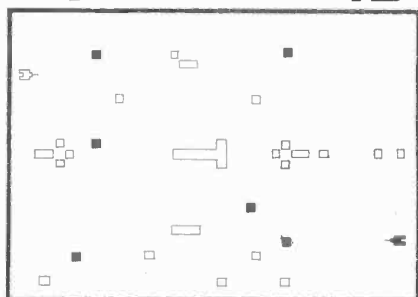


Fig 1. A simulated version of the display produced by the tank chip. See text for an explanation of the various obstacles.



our thanks to the Ministry of Defence for the photographs used throughout this article. The AFV illustrated is the Cheftain battle tank, arguably the best in the world, and NATO's main front line tank.







**Fig 2. Circuit diagram of the tank game.**

The twenty-eight pins of the AY-3-8710 can conveniently be grouped according to function, i.e., video output pins (including sync), sound outputs, control inputs and a miscellaneous group including the clock signal, power supply and a number of pins to which there is no connection.

#### VIDEO OUTPUTS

Five video outputs are provided: Sync, white video, black video, grey and blanking.

The sync output (pin 18) provides a composite (line and frame) sync signal with equalization pulses to produce a fully interlaced display on the TV screen.

The white video output (pin 28) generates the left player's tank, shell, shell burst and score as well as the fixed barriers and borders.

The black output (pin 27) is responsible for the right player's tank, shell, shell burst plus score and for the mines.

The grey background appears at pin 2 while the composite blanking signal is taken from pin 3.

These video signals are mixed in the appropriate proportions to form a composite

video signal that is fed to the UHF modulator. Note that the UHF transmission standard in this country is such that peak white corresponds to minimum carrier energy while sync tips correspond to maximum. Hence while the mixed sync signal is fed via R1 (100R) to the summing junction of R24, R25, the white output is attenuated by R13 (3k9) and the grey and black levels are set by resistors between these two extremes.

#### SOUND OUTPUTS

The sound circuits are responsible for producing the gunfire, explosion and tank movement sounds.

The tank sounds are produced at pin 21 (left tank) and pin 23 (right tank). Each tank's sound is fed via a frequency shaping network to IC2c which acts as an amplifier.

The gunfire and explosion sounds are produced by gating a digital noise source that is available at pin 20.

The gunfire envelope appears at pin 25 and is gated with the noise source in IC2b while the explosion envelope is produced at pin 26 and is gated with the noise in IC2a.

The three resulting sound outputs are fed

via mixing resistors to IC2d which performs a frequently shaping and amplification function.

From IC2d's output the sound is fed, via C8, to the sound modulator.

In order to reproduce the sound over the TV's loudspeaker we must generate a signal that is a frequency modulated about 6MHz. This can then be added to the video signal before this is fed to the UHF modulator.

This mixing is done by C16.

#### CONTROL INPUTS

These inputs control the direction of movement that each tank adopts, the firing of a tank's gun and the reset at the end of a game.

The reset is straightforward. Taking pin 10 low will reset the game. Due to the limits imposed by pin out restrictions, however, the other functions are more involved.

These functions are controlled by inputs A, B, C and D (pins 5-8), by the fire gun input at pin 9 and by the two strobe signals (tank 1 at pin 4 and tank 2 at pin 24).

In order to move tank 1 (for example) forward it is necessary to connect strobe 1 to inputs A and B, for reverse to inputs D and C,

to move counter clockwise A and C are connected to the strobe while B and D will produce clockwise movement. Connecting strobe 1 to the fire input will fire the tank's gun. The diodes D1-D16 ensure that connections appropriate to the action are generated upon pressing any of the ten control switches.

Pin 22 (barrier interaction select) is connected to ground. With this pin held high the tanks can drive through the fixed barriers producing a game that is not very interesting.

#### MISCELLANEOUS

The 4MHz clock required by the game is generated by Q1 and associated components and fed to pin 19 of IC1.

Q2 together with ZD1 and R26 form a simple series pass power supply to provide power for the modulators and the 8710 (pin 16—pin 1 is ground).

No connections should be made to pins 11, 12, 13, 14 and 15.

The only pin not mentioned thus far is pin 17 — this is a colour burst locator signal and is not used in our application.

The game continues until one person has scored sixteen points, when the score will begin to flash and funny things will begin to happen.

All this action on screen is accompanied by various bangs, squeaks and grumbling from the TV's loudspeaker.

One word of warning, although not part of GI's plans, tanks can get stuck in the sand dunes that form the game's borders. The bottom right hand corner is particularly prone to this risk so steer clear of the borders.

#### Construction

Construction of the tank game is made easier if the PCB is used (those kinky people amongst you can try it on veroboard — but we would not recommend it). IC1 — the tank chip — is an expensive CMOS chip and it makes sense to use a socket for it.

IC2 is an A series device. A in this

case means its one of the early CMOS designs and does not have any protection diodes on its input. This means that it should be treated with care, earth yourself before touching it, use a socket etc.

Other than that, construction should be an easy matter. Just make sure everything goes in the right way round (eighteen diodes in back to front is no joke).

We used ribbon cable to connect the main input to the hand held controls although any six-way cable would be suitable.

The cost of providing an on-board power supply was not thought to be justified because as the game does not consume much current it can be run from batteries, or perhaps, a calculator's mains unit.

When complete, connect up to the ariel input of your TV set, turn on and tune to channel thirty-six. Press reset and let the war begin.

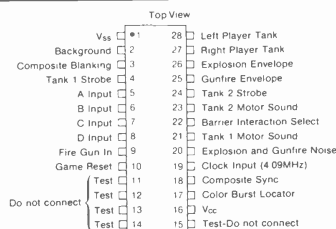


Fig 3. 8710 pinout.

#### BUYLINES

Complete kits for the tank game are to be produced by Teleplay and Watford. The tank chip itself will be available from a number of different suppliers — look through the ads in this issue. IC2 must be an A series device for correct operation so ensure the device you buy is not a more common B series type.

# PROJECT : Tank Game

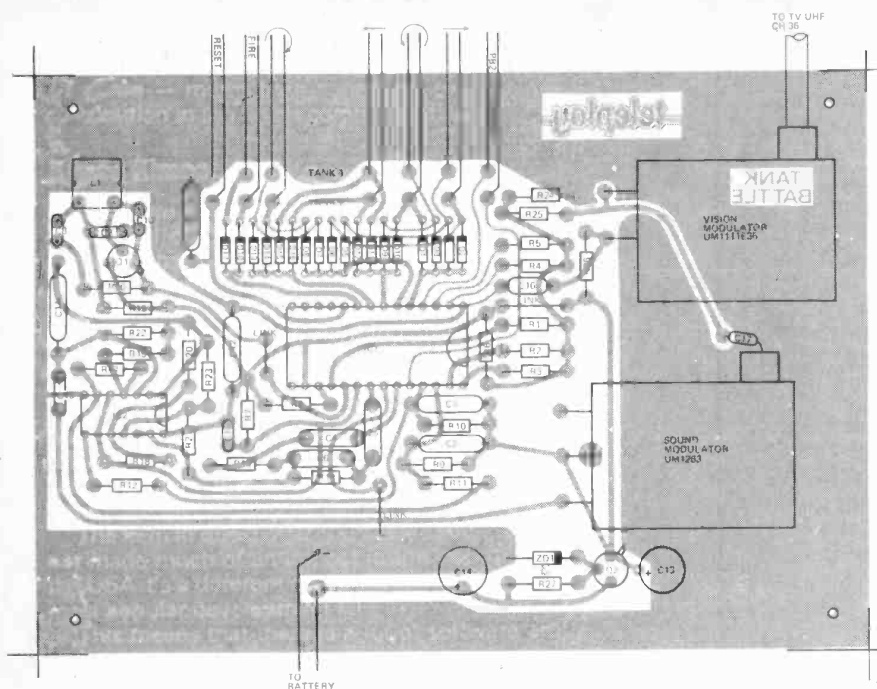


Fig 4. Tank game overlay.

## PARTS LIST

### RESISTORS

R1, 26	100R
R2, 6, 16	470R
R3, 5	3k9
R4, 25, 27	1k
R7, 13, 19, 20, 22	10k
R8	18k
R9, 10	1M
R11, 12, 14	10M
R15	100k
R17, 18, 21	22M
R23	22k

### CAPACITORS

C1, 4, 5, 6, 16	10n polyester
C2, 3, 11, 12	22n polyester
C7	1μ 0 10V tantalum
C8	56p polystyrene
C9, 10	33p polystyrene
C13, 14	220μ 16V electrolytic
C15	4μ 7 10V tantalum
C17	100p polystyrene

IC1	AY-3-8710
IC2	CD4001 AE
Q1, 2	BC109
D1-18	1N914
ZD1	6V8 400mW

SWITCHES	
PB 1-11	push to make

MISCELLANEOUS  
UM 1111 E36 (video modulator),  
UM 1263 (sound modulator), PCB as  
pattern, cases to suit.

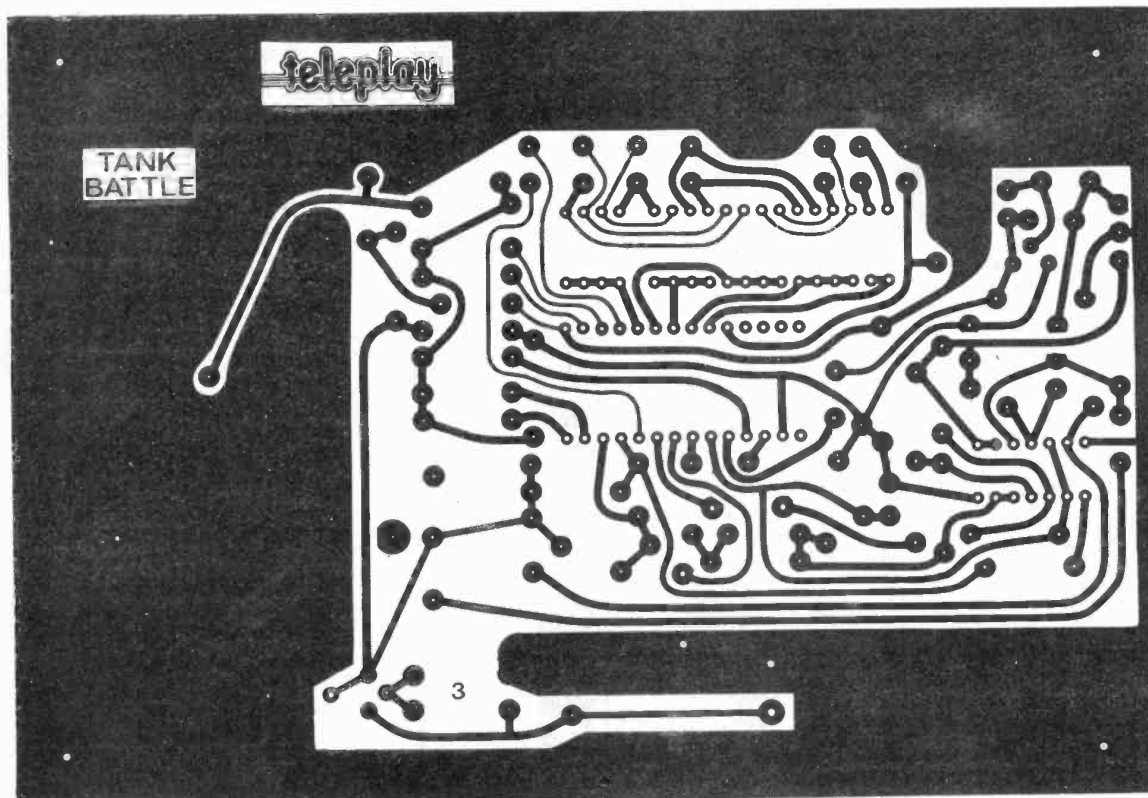


Fig 5. Foil pattern of the tank board. The copyright for this board is held by Teleplay who will supply the board separately as well as in a complete kit of parts.